Proactive and Interactive – An Examination of E-Textbooks and Considerations on How to Improve Them

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By

Emily Maag

Thesis Advisor
Megan McNames

Signed

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Abstract

In today's digital world, there is an assumption by many that digital formats are better, and this mindset has carried over into education. E-textbook sales have increased in recent year indicating their presence is growing and they are here to stay. While e-textbooks may be a more affordable and convenient alternative to print for some, research indicates students still have a preference for print textbooks. Following various pilot programs and studies, students have reported they feel they learn less reading e-textbooks and it is easier to become distracted and harder to read on a screen. The answer, however, is not to abandon e-textbooks. This essay examines student and instructor preferences, psychological research, and eye tracking data related to the use of digital textbooks and argues that it is imperative to give students the choice to use digital or print textbooks, and that e-textbooks need to have effective interactive features to facilitate student learning.

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Introduction

The goal of this research is to understand how to improve e-textbooks. Digital textbook sales are on the rise (Alter, 2015), but they are not necessarily preferred by the college students who are expected to use them. Many college students report they prefer print to digital texts, and studies suggest digital textbooks can be less engaging and lead to less active reading than traditional formats.

These obstacles pose a problem to textbook companies and educators alike. If students do not like digital textbooks, companies could lose profits. If educators are dissatisfied with a product, they may stop using it in their classes. This is a risk that goes beyond just textbooks – if people do not respond positively to digital materials or comprehend as much as they do with print materials, there is potential for significant loss. For example, if a training manual is offered exclusively in a digital format, this could isolate those with a preference for print and result in a weaker performance in the long run. Also, students may not learn as much in their classes if there is a textbook they do not want to utilize, which could pose as a threat to the career path of educators. But with digital textbook sales on the rise, it is essential for textbook companies to produce the highest functioning product that users enjoy engaging with and feel they effectively learn from.

It is important to understand the students who are currently using these textbooks. Many of these students are part of the Millennial generation. Millennials are defined as "someone who became an adult around the year 2000," or someone born between the 1980s and the 2000s, giving them an age range of 16 to 36 in 2016 (Meyer, 2016). Some refer to these people as "digital natives," or people who were "raised in a digital, media-

saturated world" (Meyer, 2016). Marc Prensky, an education consultant, came up with the term in 2001, arguing this generation "have vastly different learning requirements than…'digital immigrants,'" and they "think and process information fundamentally differently" (Meyer, 2016). Millennials are perceived as thinking differently, and having different learning patterns and requirements. By this thinking, one could infer they must also have different preferences and needs for learning.

However, is this association a fair assumption? While Millennials may be more accustomed to digital formats, this does not assert they prefer or perform better with them (Meyer, 2016). As Millennials can be more experienced with digital formats, this is an opportunity for textbook companies to explore new territories and create a product that converts digital textbook naysayers to dedicated digital bibliophiles.

This essay is an investigation into the implications of relying solely on e-textbooks as they are currently, as well as the dangers of enforcing a singular learning tool to a generation of students whose learning preferences can often be misinterpreted. Information was accessed via secondary research during a three-month time span. Research focused on peer-reviewed journals and studies dealing with reading patterns, learning preferences, eye tracking studies, and more.

Literature Review

E-readers are handheld, portable devices designed to digitally display a variety of written content; they frequently offer wireless Internet connections and other features to help readers enhance their interactive experiences (EDUCAUSE, 2010). The very first e-reader went on the market in the late 1990s, but they did not gain mainstream popularity until the mid-2000s (Kozlowski, 2010). The presence of e-readers has brought e-

textbooks, which are digital versions of print textbooks (Free, 2015). E-textbooks are often praised for their reputation as a more affordable alternative to print textbooks (James Madison University, 2016). E-textbooks are appealing to publishers because there is no reselling process, and their profits can stay their profits (James Madison University, 2016).

In 2012, Forrester Research reported eight million fewer e-readers were sold than the 20 million sold in 2011, indicating a possible decline in e-textbooks (Alter, 2015). However, in contrast, some textbook companies are selling more digital than print products (Straumsheim, 2016). Textbook company McGraw-Hill Education reported that, in 2015, their digital products outsold print products, and textbook company and digital learning giant Cengage also reported their fiscal year is on track for digital sales to exceed print sales in both revenue and units sold (Straumsheim, 2016).

As all signs suggest that e-textbooks are here to stay, it is imperative to maximize their capabilities. It matters how students feel about using the e-textbooks, the effect digital textbooks can have on learning, and how people read differently when they read on a screen versus on a printed page.

Student Preferences

In a direct comparison between print and digital texts, a study conducted by technology giant Hewlett-Packard found 57 percent of college students surveyed preferred print books, whereas only 21 preferred e-textbooks (Catalano, 2015).

Students report they often feel they read more carefully when they read print text (Baron, 2014). One of the biggest factors these students report for reading more carefully with print is the lack of distraction (Baron, 2014). Millennials are much more prone to

multitasking, which could hypothetically make digital textbooks more appealing, but being more prone to multitasking does not mean these Millennial students are good at multitasking (Meyer, 2016). This multitasking can actually be damaging to learning as it increases the cognitive load, which can force the reader to pause and reconsider what was just read before moving forward or pursuing a new task (Meyer, 2016). The context switching that occurs with multitasking is a common byproduct of cognitive overload, and it is correlated to higher stress levels in college students (Meyer, 2016).

E-textbooks can also have harmful physical effects. In a study comparing comprehension differences among print, e-ink, and LCD formats, readers reported experiencing fatigue only when reading off of an LCD screen (Baccino et al, 2013). This poses a problem for e-textbooks. A survey conducted by the Software Usability Research Lab at Wichita State University reported 76 percent of college students are using e-textbooks in Spring 2015, which was up from the 53 percent who used them in Fall 2013 (Chaparro, Gillett and Jardina, 2016). While this number is on the rise, so is the number of students who access e-textbooks on their computers. Seventy five percent of students access their e-textbooks on desktop or laptop computers, whereas only 50 percent use tablets and 31 percent use smartphones to access e-textbooks (Chaparro, Gillett and Jardina, 2016). Not only is the number of students who use e-textbooks steadily increasing, but so is the number of students who consistently access e-textbooks on devices with LCD screens, leading to likely higher levels of reading fatigue.

Although computers can appear to be a more common way for students to access e-textbooks, there are many who use e-readers to do so. When Amazon launched the Kindle DX in 2009, they distributed them to seven different colleges to engage students

in pilot programs to test their responses to the product and its functions (Marmarelli and Ringle, 2010). The Kindle DX, which measured 9.7' diagonally and was as thin as the average magazine, allowed users to read on an e-ink screen without a glare, and it had a built-in PDF reader and could hold up to 3,500 documents (Amazon, 2009). At West Chester University of Pennsylvania, students reported they liked the convenience of having all of their textbooks in one place (Penny, Schugar and Schugar, 2011). Students participating at the same study at Reed College also liked the convenience as well as legibility of the texts, durability of the device, and the ecological benefits (Marmarelli and Ringle, 2010). Students in the Darden School of Business at the University of Virginia overwhelmingly disliked the Kindle DX for academia; 75 to 80 percent said they would not recommend the device to incoming students for academic purposes, but 90 to 95 percent said they would recommend it for personal recreational reading (Schmid, 2010). Similarly, students participating in the trial at Princeton University said they also believed the Kindle DX is significantly better for pleasure reading than it is for study reading (The Trustees of Princeton University, 2010).

However, that may not be a popular suggestion as most readers, generally speaking, find it more relaxing to read print text versus electronic devices, regardless of whether it was an e-reader, tablet, or personal computer (Nielsen, 2010). This corresponds with other surveys that found readers prefer print to all other formats (Baccino et al, 2013).

Outside of students enjoying the convenience of the Kindle DX, they did not provide much positive feedback. Many students said they believed it was inefficient to use and therefore not meant for fast-paced environments (Penny, Schugar and Schugar,

2011). Since it was difficult to turn the pages on the e-textbooks, students found they fell behind during in-class activities and discussions (Penny, Schugar and Schugar, 2011). Some students reported they even resorted to only using their Kindle to prepare and using a traditional print textbook in class to stay on track (Schmid, 2014). It is not uncommon for students to print out digital texts; while many enjoy the additional features and convenience of digital, they prefer the fewer distractions that come with reading in a print format (Liu, 2006). Having this print format can help keep readers and students in track, whether it be in class or during personal study times (Herold, 2014).

Students strongly disliked the annotation and highlighting features of the Kindle DX (The Trustees of Princeton University, 2010). While they did enjoy that the system forced them not to be "serial highlighters," the students reported the tools were often ineffective in helping them actually remember what they read (The Trustees of Princeton University, 2010). Students said they believed the highlighting or taking notes on these e-readers had a negative affect on their comprehension (Marmarelli and Ringle, 2010). A professor echoed these concerns, worrying his students read more passively while reading on an e-reader in comparison to previous courses without e-readers (Marmarelli and Ringle, 2010). He felt his classes had weaker discussions and poor assignment performance in comparison to previous semesters (Marmarelli and Ringle, 2010). While there is not necessarily a consistent statistically significant difference in comprehension between print and digital readers as a whole, there is a difference evident when looking at individual cases (Niccoli, 2015). Print readers tend to comprehend more than digital readers; testing with both multiple choice and short answer questions suggests readers comprehend and retain more when reading print sources (Niccoli, 2015).

Related to the Kindle DX pilot program, an experiment studying the Nook, a different e-reader, found a similar correlation between note-taking and e-textbooks. While 50 percent of traditional readers highlighted their print textbooks, only 14.3 percent of Nook users highlighted their e-textbook. (Penny, Schugar and Schugar, 2011). While 28.6 percent of traditional readers took notes directly in their print textbooks, only 15.4 percent of Nook readers took notes directly in and annotated their e-textbooks (Penny, Schugar and Schugar, 2011). While these numbers are telling of the relationship between reader and format, they withstand even when a third factor is brought in. Only 21.4 percent of Nook readers took notes on a separate piece of paper while reading their e-textbook, whereas a staggering 64.3 percent of traditional readers took notes on a separate piece of paper while reading a print textbook (Penny, Schugar and Schugar, 2011).

There is also a "hierarchy of readings" within the minds of students, and many tend to prioritize print over digital readings, believing printouts or print texts are more important (The Trustees of Princeton University, 2010). Many students print out their own copies of texts (Liu, 2006), which is unsurprising as many dislike the PDF formatting and availability of the Kindle DX (Marmarelli and Ringle, 2010). The preference goes beyond just PDFs, however. Ninety percent of students said they prefer hard copies of documents for schoolwork, and 92 percent prefer print versions of any long texts (Baron, 2014). There is a perceived higher level of concentration when reading a print text, as 92 percent of students said it is easier to concentrate on a printed hard copy than it is digital, especially as they are able to take notes on the page to help them better remember information (Baron, 2014).

Textbook companies argue that e-textbook options are more affordable, and a lot of their motivation lies within they are more profitable and efficient for them (James Madison University, 2016). However, money can come second to preference when it comes to learning. Some students have said they would not use an e-textbook even if it were free, and they would choose to purchase a print copy instead (James Madison University, 2016). A survey conducted by the Student Public Interest Research Groups found 60 percent of students would purchase a low-cost print copy of a textbook even if the digital equivalent were free (James Madison University, 2016). Similarly, students involved in the Kindle DX study did not think the high initial price of an e-reader was worth it, saying the price would need to drop at least $100 before they saw the value in making the purchase (Marmarelli and Ringle, 2010). In the Princeton University section of the Kindle DX study, more than half of students agreed with the response "I would pay an additional fee to buy a paper book that I could also load to an e-reader" in a post-experiment survey (The Trustees of Princeton University, 2010).

Reading Patterns

Students do not only dislike e-textbooks, but they are also bad at reading them (Baron, 2014). Eye tracking studies have suggested students read differently depending on if they are reading digital or print (Anson and Schwegler, 2012), and the effects can be damaging if they do not change their behavior (Love, 2012).

Eye tracking is a process which measures and monitors eye movement (Eyetracking Inc., 2011). A device monitors reflections of light in the pupils of readers to follow eye movement, which can provide important data about things like how people read or what the eye is first attracted to on a page (Eyetracking Inc., 2011).

In addition to monitoring reflections in pupils, eye tracking is able to monitor pupil dilation (Anson and Schwegler, 2012). Eye tracking studies have suggested that "greater cognitive demands lead to greater dilation, which provides additional insight into moments when the writer is working harder to create or interpret text" (Anson and Schwegler, 2012). E-textbooks tend to encourage multitasking, and multitasking can cause an increase in the cognitive load (Meyer, 2016), but no negative effects of dilated pupils in relation to fatigue while reading e-textbooks have been found (Anson and Schwegler, 2012).

Eye tracking studies also suggest that readers change their styles depending on what they are reading (Anson and Schwegler, 2012). Regardless of format, readers naturally tend to skip text they see as unimportant, including common phases, patterns, material inferred from context, words not perceived as necessary for the full syntactic elements, and peripheral elements, such as citations, in academic writing (Anson and Schwegler, 2012). However, studies also suggest readers are prone to more "non-linear" patterns when reading on screens, meaning their eyes move all over the page rather than following a more traditional left to right pattern (Raphael, 2014).

These kinds of reading patterns can be referred to as scanning, and they can affect comprehension (Raphael, 2014). It can be dangerous for readers to scan and skim as they can become more selective with what they read, meaning they can miss out on important information they accidentally perceive as unimportant or secondary (Love, 2012). This reading style can be damaging to the learning capacity of the readers as it can be limiting; readers may become too preoccupied with finding more information rather than taking the time to digest what they have already read (Wolf, 2010). An effective way for most

readers to comprehend information is to skim and scan the pages, but taking the time to stop and reflect on what catches their eye and digest the information (Love, 2012).

Fixation, which is the amount of time spent on a word when reading, can be affected by the difficulty of the text, the nature of the text, and the relationship and background of the reader with the text (Anson and Schwegler, 2012). Difficulty of the text can also affect reading speed (Anson and Schwegler, 2012), which can also affect the cognitive process employed (Barzillai and Wolf, 2009). The most time consuming of cognitive processes is deep reading, which pushes forward comprehension and includes inferential and deductive reasoning, analogical skills, critical analysis, reflection, and insight (Barzillai and Wolf, 2009).

Physiologically speaking, it requires a different brain circuit for deep reading, and it can be more challenging (Barzillai and Wolf, 2009). The brain is not wired to constantly process information (Wolf, 2010), so it is important for readers to challenge themselves to participate in deep reading as it can help readers maintain the advantages of print reading in an increasingly more digital world (Barzillai and Wolf, 2009). However, readers need to be willing to dedicate the time to reading deeply as attempting to accelerate comprehension efficiency via digital reading can actually damage comprehension in the long run (Wolf, 2010). Not only are readers at risk of missing something because they are worried about finding the next bit of information (Wolf, 2010), but it is also difficult for the brain to switch from different reading and comprehension styles (Raphael, 2014).

Readers are also conscious of the way they read. In a study monitoring undergraduate students, students read print novels while wearing eye tracking devices,

and were to self-report when they felt they were zoning out, which was defined as moments when they "realize[d] that [they] ha[d] no idea what [they] just read" or they were "not only…not thinking about the text, [they] were thinking about something else all together" (Reichle, Reineberg and Schooler, 2010). Participants reported they found themselves zoning out 8 to 36 times while reading the print novel, and the eye tracking devices found participants were zoning out nine percent of the time without realizing it (Reichle, Reineberg and Schooler, 2010). This suggests that although readers may believe they are conscious of how they are reading, there may still be a tendency to begin to lose focus. Researchers using eyetracking devices also found readers had "erratic patterns of eye movement" before they zoned out, and "when eye movement showed a sensitivity to more variables, it was evident they were reading more mindfully than they were reading mindlessly" (Reichle, Reineberg and Schooler, 2010).

While this study did not suggest any indication of reading speed, a study by the Nielsen Norman Group suggestd reading print formats can take longer than both Kindles and iPads (Nielsen, 2010). In the study, avid readers all read an Ernest Hemingway short story on the three previously mentioned formats as well as on a PC; the average reading time for all patterns and formats was 17 minutes and 20 seconds (Nielsen, 2010). There was no significant time difference between the Kindle and the iPad, but the iPad was 6.2 percent slower than print and the Kindle was 10.7 percent slower than print (Nielsen, 2010). The participants were given a quiz following the reading, but the results did not indicate any significant differences in comprehension across the platforms (Nielsen, 2010).

Engagement with Text

Since digital reading requires a different brain circuit, it can be difficult for deep reading, which brings readers into the text to further explore information (Barzillai and Wolf, 2009). If readers are not enticed to spend more time on the text, their relationship with it could be very brief and they may just barely skim the surface of comprehension potential.

In a world where readers tend to search for specific information (Love, 2012) and reading patterns are more sporadic because of skimming (Raphael, 2014), it is important to consider how pages are designed to better suit readers. Chunks of text can lead to mindless reading (Reichle, Reineberg and Schooler, 2010), so having shorter bursts of text and formatting like bullets can help aide readers with comprehension and staying focused.

Digital textbooks open up a whole new world for possibilities to keep readers engaged and reading beyond breaking up text with more visual formatting. Interactivity is key with keeping readers engaged (Erdmann et al, 2015), and readers prefer "digital features…[that] complement the traditional text, are easy to follow, and blend with reading preferences" (Herold, 2014). Readers respond to features that are natural, and, while they are noticeable, do not interrupt the reading process, but rather naturally enhance it.

Clickable links and additional tools like concept maps are a simple but effective way for digital textbooks to become more user friendly, particularly by increasing usability and comprehension (Erdmann et al, 2015). Students who interact with these features spend more time with the text (Erdmann et al, 2015), and this could increase the likelihood of deep reading (Barzillai and Wolf, 2009).

An additional feature of e-textbooks can be e-learning applications. While evolving technology has edged out the need for additional software, "using tools such as concept maps, or other visual aids in combination with e-texts, would improve the perceived usefulness of an e-learning applications" (Erdmann et al, 2015). More integrated e-textbooks keep everything all in one place for readers, and they have control of things they choose to explore further.

Although there are new forms of technology for students to learn from, there is still a strong intersection of learning styles old and new. While many e-readers feature annotation tools, many students do not prefer them and take notes elsewhere rather than directly within digital texts (Penny, Schugar and Schugar, 2011). Note taking allows students to reflect on material as well as provide themselves with resources they are assumed to re-read later to learn more (Boch and Piolat, 2005). If students are taking notes in formats aside from directly in their books, there is a chance they may not revisit or reflect on the text again, relying solely on what they identified as important in the text.

However, students may be on to something by not taking notes directly "on" their e-textbooks. Studies show students who take notes by hand tend to have a "stronger conceptual understanding" than their counterparts who take notes via digital formats, such as laptops (May, 2014). As laptops are a popular way for students to access e-textbooks (Marmelli and Ringle, 2010), it can be problematic for them to be encouraged to take notes directly in these texts. Instead, students taking notes by hand utilize a different type of cognitive processing, which could potentially help in preserving the deep reading process (May, 2014).

There may be little room for improvement in terms of getting readers to confidently take notes directly in a digital textbook. One study found students preferred to take notes by hand rather than on a laptop, and students scored better on comprehension tests over material when they took notes by hand rather than via a keyboard and digital format (Duran and Frederick, 2013). This indicates the importance of the written word still in education (Duran and Frederick, 2013) despite assumptions that digital is the preference of Millennials and young students (Meyer, 2016).

Recommendations

Students still need to be given a choice to use either a digital or print textbook.

The assumption that Millennials like everything to be digital and work better with digital is a false claim and generalization. Just because the majority of this group of students group up in the digital world does not mean they prefer to work with digital formats of works exclusively (Meyer, 2016). However, even if they do not like working with digital formats, these students expect to do so at some point (Comden et al, 2013). Students reported in a survey following the Kindle DX study they would pay for a print textbook even if there a free digital version was available (James Madison University, 2016). As college students are stereotyped as putting economic concerns first, these reports from participants challenge this assumption as well as the idea that Millennials always want digital.

College students are stereotyped as not having much money and to be always seeking a good deal (Webley, 2011). This becomes troublesome as textbook prices have increased 800 percent in the last 30 years (Band, 2013). The National Association of College Stores found the average price for a new textbook was $57 in 2007, which

increased to $65 in 2010 and $79 in 2013 (The College Board, 2016). They also found the price gap between new and used books has also increased from $49 to $59 in a similar time frame (The College Board, 2016). With textbook prices this high, a student can spend, on average, anywhere from $655 (Nawotka, 2012) to $1200 (U.S. PIRG Education Fund and the Student PIRGs, 2014) on textbooks annually. These high prices have deterred 65 percent of students from buying textbooks, even if they felt it was going to negatively impact their grade in the course (U.S. PIRG Education Fund and the Student PIRGs, 2014).

Professors often further the problem by assigning a specific text edition or bundle without checking the price first (Nicholls, 2010). Students are in a position where, regardless of price, they are required to purchase any text or materials they are assigned; they are "captive customers," according to Nicole Allen, a spokeswoman for the Scholarly Publishing and Academic Resources Coalition (Popken, 2015). However, allowing students to have a choice of text format gives them a bit of freedom from this "captive" environment as they can choose the format that best first both their learning preferences and economic situation. Most students in a pilot program for e-textbooks said they did not care if they had to use print or digital books as long as they were given the chance to make a choice between the two (Venable, 2012).

When they are given a choice about buying a text, 78 percent of students said that cost is a major factor in their choice of an e-textbook rather than a traditional print text (deNoyelles et al, 2015). Allowing students to make the choice between formats can potentially help them with their coursework but also majorly save money. For example, a copy of a new, hardback molecular biology textbook cost $104.31 on Amazon, and used

copies started at $40 (Webley, 2011). However, purchasing the Kindle version was $39.99, and renting was even cheaper (Webley, 2011). The initial renting price started at $18.36, and the price to rent the book for six months was $34.08 (Webley, 2011).

The Internet has completely changed the face of the textbook market (Band, 2013). Sites like OpenStax are starting to develop free online textbooks, but the offerings are still fairly sparse (Band, 2013). Allowing students to choose if they purchase or rent their texts as well as the format does put the ball in their court, and it can give them the chance to save some money. E-textbooks can sometimes cost 50 percent less than their new print counterpart (Nicholls, 2010), but there are other times where a new print version is only a $15 increase from the digital format (Abutaleb, 2012).

Under the assumption digital is better and cheaper, some universities have begun to require students to purchase digital texts (Abutaleb, 2012). Indiana University first tried this system in 2009; the university negotiates lower e-textbook prices with companies and students are required to purchase them via a charge on their bursar account (Abutaleb, 2012). Sixty percent of students in this program said they prefer digital because of the low cost (Venable, 2012), but some professors and students said they liked parts of the book but still appreciated print books overall (Abutaleb, 2012).

Programs like this are a way to encourage students to adapt to and like using e-textbooks, and results are mixed (Abutaleb, 2012). Some students do not feel like they saved any money buy purchasing the required e-textbook, and even would purchase the print text despite the price difference (Abutaleb, 2012). A student who was required to purchase two e-textbooks at the University of Wisconsin said she printed things from the digital formats she was required to buy, and she "see[s] what [universities] are doing to

make textbooks cheaper and less paper-reliant, but [she] doesn't think it'll work in the long run" (Abutaleb, 2012).

It is not uncommon for students to print out online resources or parts of their e-textbooks (Liu, 2006). Students have said they feel there is a "hierarchy of readings," and they think print materials are more important than e-textbooks or other digital items (The Trustees of Princeton University, 2010). However, students said they find that e-textbooks are more affordable and efficient for them (James Madison University), and they also like the convenience of having all of their books in one place (Penny, Schugar and Schugar, 2011). To combat the "hierarchy of readings" but still appealing to some of their preferences, students said they would pay a fee for a print book that also has an e-reader or e-textbook option (The Trustees of Princeton University, 2010). If universities are going to continue to force students to purchase e-textbooks before classes begin, they should work with textbook companies to make this option a possibility. Another option in fighting the "hierarchy of readings" would be to make all e-textbooks printable as students frequently print out digital resources (Liu, 2006). Since universities already work with companies to figure out lower rates for these pre-purchases, it could potentially be just another factor to work into conversation (Abutaleb, 2012). Offering a choice between the two or for a combination of both formats could help alleviate the tension caused by students who said they did not like the dependence on technology or Internet access using an e-textbooks forced them into (Gallagher and Jassmond, 2013). A combination of the formats, or at least the option for it, would help make the textbooks more feasible for anyone at anytime anywhere (Comden et al, 2013).

This format would be beneficial for in a classroom as students reported they did not like how hard it could be to turn a page on an e-textbook, making it easy to fall behind during in-class discussions and activities (Penny, Schugar and Schugar, 2011). Combining the formats allows students to prepare how they want as well as participate how they want, and some students already utilize each format for different tasks (Schmid, 2014). Students frequently print out documents because of a general preference for hard copies for both academic and long texts (Baron, 2014). Regardless of format, students will still have standards and prefer one over another (Schwartz, 2012).

Students recommended e-readers and e-books more for pleasure reading than academic work (The Trustees of Princeton University, 2010) even though others have reported it is more relaxing to read print than it is to read digital formats (Nielsen, 2010). It is important to keep a distinction between the two types of reading, and it is essential that e-textbooks are clearly still textbooks, meaning readers still need to engage with them in ways similar to a traditional print textbook (Gallagher and Jassmond, 2013). Students participating in the Kindle DX pilot program reported not like the annotation or highlighting features on the e-reader, which has the power to bar them from working with an e-textbook in a way similar to a traditional text (The Trustees of Princeton University, 2010). Students reported liking features available on e-textbooks, but most of them were dissatisfied with their experiences using them (deNoyelles et al, 2015). If students are dissatisfied, they may not make a repeat purchase of an e-textbook, may not use the e-textbook they are already charged for as a required text, or try to work with e-textbooks to adapt their learning styles.

Instructors also play a role in the preferences of how e-textbooks are used. Thirty one percent of students in the Indiana University reported they wished professors would use e-textbooks more, but it is unclear if they meant using them in class or more courses using e-textbooks (Venable, 2012). The ambiguity of the instructor's role in adopting e-textbooks is common, and it could have an effect on how much students actually use the e-textbook (deNoyelles et al, 2015). Students reported they wished instructors would be more upfront about digital formats, whether it is about digital options or features of e-textbooks already in use (deNoyelles et al, 2015). One specific feature students like related to e-textbook annotations is the ability for professors to leave annotations for students to read, but students wish professors would utilize it more as a way to interact and strengthen the text (deNoyelles et al, 2015). If instructors are not going to take the time to use e-textbooks to the best of their ability, there is little to no valid reason for them to not only encourage purchasing them but to actually require students purchase them.

E-textbooks should not be interactive just for the sake of interactivity, but rather to support and enhance learning.

Regardless of the format, an e-textbook is still a textbook, and it needs to be clear that it is (Gallagher and Jassmond, 2013). The format needs to encourage readers to keep in mind they are reading a textbook, and that the content is still important, even if they may place a higher level of importance on a print counterpart (The Trustees of Princeton University, 2010). Because of the evolving technology available to textbook companies, they should take advantage of the opportunity to "aid learners in the reading experience

by enhancing content in diverse ways" (deNoyelles et al, 2015). It is not so much that the books themselves need to be interactive, but rather the content.

While it is important to consider making the e-textbooks interactive as a way to better engage students, it should not be done just for the sake of interactivity (Itzkovitch, 2012). It is essential these features exist to enhance the learning or storytelling experience via content (Itzkovitch, 2012). Creative effective interactive content requires considering what kind of course the textbook is for, such as including animations and illustrations in novels or collections of stories or the ability to perform virtual science experiments based on the material just covered (Itzkovitch, 2012). Not only do these features demonstrate just the start of the capabilities of e-textbooks, but students also enjoy them. Students reported they frequently read, use, and enjoy supplemental materials, such as practice problems (Gallagher and Jassmond, 2013). As textbook companies explore technology and make e-textbooks more exciting, they work to entice readers to engage more with material, and this repeat action could benefit the students more in the long run.

Eye tracking studies suggest readers adopt more non-linear reading patterns when reading on screens, and this scanning style of reading can be damaging (Raphael, 2014), but there is potential to improve comprehension with more interactive content. Comprehension in digital formats has strong potential when readers scan the pages while taking time to pause and reflect on content as it draws them in and forces them to process information (Love, 2012). If readers are not taking the time to reflect on every single word they read on a screen, the extra activities are a different opportunity for them to engage with content in a way that may better suit or interest them. They also provide reinforcement of the content already presented, whether it is having students apply

techniques they just read about to perform a virtual experiment or quizzing them about key terms from a chapter.

Faculty members may have more ability than they realize to work to ensure their students read and understand exactly what they want them to gain from an e-textbook. E-textbooks are non-static, meaning they are not permanent and are prone to changes (Gallagher and Jassmond, 2013). This gives faculty the ability to edit chapters by either removing nonessential chapters or combining them together (Gallagher and Jassmond, 2013). Instructors have the ability to leave annotations on materials for students, allowing them to keep material current and offering further context on what is most important (Comden et al, 2013). Instructors working with the text and actually taking the time to annotate the e-textbook can help build understanding and student preference for digital over print (deNoyelles et al, 2015), but these kind of interactive features between faculty and students that actually attract students to digital opportunities are not being used (Schwartz, 2012). Instructors are failing to use features like annotations, collaborations, and shared notes (Schwartz, 2012), and students wish instructors would annotate and be more upfront about digital texts more (deNoyelles et al, 2015). This is not an interactivity failure on behalf of students or textbook companies – it is a failure by faculty members. Professional development could help ensure faculty members understand how to use these kinds of tools and how to better entice their students to use digital instead of print (deNoyelles et al, 2015).

Instructors are not the only ones not using annotation features provided by e-textbooks. During the aforementioned Kindle DX pilot program, only 15.4 percent of readers took notes directly in their e-textbooks, and 21.4 of students using digital

textbooks took notes on a separate sheet of paper (Penny, Schugar and Schugar, 2011). However, this is not necessarily a bad thing; taking notes via an electronic device "does not always foster learning" (May, 2014). Research suggests taking notes by hand rather than on a laptop helps students learn more (May, 2014), which is worth noting as 78 percent of students use computers to access e-textbooks (deNoyelles et al, 2015).

Handwritten notes, however, utilize a different cognitive process than reading does (May, 2014). While handwritten notes may help learning and comprehension (May, 2014), switching between different tasks and formats in an attempt to multi-task can damage the cognitive load (Meyer, 2016). Students not using the annotation tools could be a direct reflection of preferences and not liking the tools provided by e-textbooks (The Trustees of Princeton, 2010). Although some students said they did not find the annotation tools effective in helping them remember what they read (The Trustees of Princeton, 2010), improving the annotating capabilities in conjunction with better instruction for faculty on how to use annotation tools could help students, at a minimum, compare what they took away from the reading with what their instructor intended for them to get out of the reading (deNoyelles et al, 2015). Students may still have preferences for note taking styles and how they believe they correlate to their learning and performance, but those who prefer all-in-one style note taking directly in a book – no matter if it is a print or digital textbook – should not be penalized for their preference. Improving annotation abilities for teachers and students could create a more interactive and cohesive learning experience both in the sense of course material but also a cohesiveness that transcends across personal study time and classroom learning.

These efforts to maintain comprehension are imperative as reading is still a relatively new cognitive function for humans (Barzillai and Wolf, 2009). Taking the time to understand and find meaning in content helps shape and maintain the reading circuit in the brain, and e-textbooks have a multitude of possibilities to help foster deep reading and extended thought to find meaning (Barzillai and Wolf, 2009). There are concerns, however, the Internet and digital formats can cause too much stimulation to take the time to engage in deep reading on screen similar to that on paper (Raphael, 2014). These "distractions" – bites of sound, text, and mind – could reduce the value readers put on information as they are not wholly engaging with the extras in favor of moving on quickly as a way to complete the literary task at hand (Wolf, 2010). Digital can make people feel they need to read faster, and this is assumed efficient, and people may just skip right over the interactive extra features that are offered (Wolf, 2010).

However, this efficiency is just perception, and it can damage deep thought (Wolf, 2010). Cohesive, relevant interactive materials can force readers to become "thinking readers" as they make readers take a second to process what they have read and to make connections (Barzillai and Wolf, 2009). There is a demand for more active and engaged reading in print as well, as the aforementioned study involving a print novel found participants zoned out 8 to 36 times while reading, and it could happen when they were not even realizing it (Reichle, Reineberg and Schooler, 2010). Better interactive features could keep readers more engaged as well as assist in building their preference for digital over print.

The ability to provide these unique possibilities is a clear advantage for digital over print, but there is a stigma on digital that must be overcome before students realize

there can be a benefit to scanning digital content and taking the time to review texts and engage with interactive content.

Conclusion

While e-textbooks are imperfect, they have value and potential. Sales indicate it is worthwhile for textbook companies to invest the time in improving textbooks. Student preferences from e-reader and e-textbook pilot programs suggest students do not totally dislike e-textbooks, but they are not completely satisfied with how they are today.

E-textbooks can more affordable than traditional print versions, but students do not always like reading on a screen instead of a page. There is a possibility for bundles of print and digital versions, but could this still be a higher cost to students? If offering students a print version accompanying a e-textbook drives the cost up, this could result in e-textbooks losing a lot of their appeal for some students. However, if this bundle format grows in popularity, there potentially is a space for the price to become more affordable.

Improving e-textbooks and offering these bundles may drive the price up, and this could drive students away. As many students reported the low cost was a major draw of choosing digital over print, it is possible e-textbooks may not be able to withstand increasing prices that put them at similar price points as print textbooks. Although it is not definitive improving e-textbooks will make them more expensive, there is also inconclusive research indicating whether or not these improvements will be enough to convince students to pay the extra sent for the added benefits.

It is important e-textbooks are different than print textbooks, and interactivity plays a key role in the differentiation. Interactive elements matter to some students, but not all. There is not a definitive answer as to how to make these students care more about

interactive features, but it is worth noting that students value having a choice. Forcing students to utilize interactive elements does not necessarily benefit anyone, whether it is students who may grow to resent their e-textbooks, or instructors who are frustrated by lack of participation by their students or who are ignorant of how to properly use the features of the textbooks. Instructors need to fully understand how to use e-textbooks, but it is important they also try to communicate with students to come to a mutual understanding of expectations of using e-textbooks.

There are some universities that are requiring students to purchase e-textbooks before classes begin. While the surveys from these pilot programs indicate a majority of students like using e-textbooks and their affordability, they do not offer much insight on students' perspectives before using the e-textbooks. The information could be entirely skewed based on experience with e-textbooks only, but this does not negate that students see benefits of e-textbooks. However, there is a lack of data about the exact number of universities that are requiring students to purchase e-textbooks for courses, what kind of courses this is happening in, and how this is affecting sales. Requiring e-textbook purchases can have an effect on e-textbook sales, negating the correlation students are growing to prefer e-textbooks.

Regardless of choice or requirement, students are using e-textbooks. If print textbooks were once the most popular learning tooling, it is likey they were written and formatted with students' best interests in mind. Therefore, if e-textbooks are considered to be the future of educational resources, it only makes sense to put in the time and effort to make them everything students could need to succeed.

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Abutaleb, Y. (2012, August 13). Some universities require students to use e-textbooks. Retrieved from http://usatoday30.usatoday.com/money/markets/story/2012-08-13/etextbooks/57039872/1.

Yasmeen Abutaleb was a reporter for *USA TODAY* at the time she wrote this article. She was a general assignment business reporter, and this article examines e-textbooks and how some universities require students to purchase them.

The article includes interviews with students and professors from universities that participated in pilot programs that required students to use e-textbooks. It also includes secondary research about the rising costs of textbooks as well as insight on the digital versus print argument.

In 2012, e-textbooks accounted for only 9 percent of textbook purchases. Eric Weil, president of Student Monitor, said "[e-textbooks] ha[ve] to overcome the advantages that students see [in] a printed textbook" in order for students to prefer and get excited about them. While some argue digital textbooks are always much cheaper, there is sometimes only a $15 price difference between an e-textbook and the print version. The pilot programs, however, require students to pre-purchase textbooks. Indiana University, for example, charges students through their bursar accounts and does not give them the option to purchase a print textbook. While a goal of the e-textbook pilot program was to combat the anti-e-textbook attitude of many students, most students and professors said they preferred digital over print. However, Indiana University professor Timothy Baldwin said he planned to continue using the e-textbook despite negative feelings and reactions.

Academia Stack Exchange. (2014). Is it ethical for a lecturer to require students to purchase an online learning kit where kit is used for course assessments? Posted to http://academia.stackexchange.com/questions/18190/is-it-ethical-for-a-lecturer-to-require-students-to-purchase-an-online-learning.

Academia Stack Exchange is a forum for academics and students in higher education. This forum is only available for those involved in higher education for free.

A student asked if it was ethical for a professor to require students to purchase online learning textbooks that have learning resources attached that are required to complete the course. Essentially, the student was trying to determine if it was fair for a professor to lower a student's grade if they did not purchase the online textbook and software package, or if they could not afford to.

The forum challenges the idea that a combination of textbook and online package could help resolve the digital versus print text debate because of its high cost. Additionally, assigning the software could be as problematic as assigning a specific textbook option. However, professors may not realize what they are doing until a student points it out to them. Students may see it as a waste of money, especially if multiple of their classes assign these kinds of materials, but professors may be completely unaware.

Alter, A. (2015, September 22). The Plot Twist: E-Book Sales Slip, and Print Is Far From Dead. Retrieved from http://www.nytimes.com/2015/09/23/business/media/the-plot-twist-e-book-sales-slip-and-print-is-far-from-dead.html?_r=1.

Alexandra Alter is a journalist for the *New York Times.* Her work focuses on arts and entertainment, and business and finance.

The article is an investigation into the shifting market of digital and print books. Sales are indicating an unprecedented spike in print sales and a decline in e-book sales.

E-book sales increased 1,260 percent between 2008 and 2010, and Borders declared bankruptcy in 2011. The combination of these events, for many, indicated a grim outlook for the future of print books, and analysts predicted digital books would champion print by 2015. However, the opposite has happened, as e-book sales decreased 10 percent just in the first half of 2015, and in 2014, digital sales of almost 1,200 publishers made up about 20 percent of the market, which is the same as they did just a few years prior. In 2014, 12 million e-readers were sold, which was 8 million fewer than the 20 million sold in 2011.

Additionally, in 2012, 50 percent of people said they read books primarily on e-readers, but that number fell to 32 percent by the first quarter of 2015. Because of the growing resurgence of print, publishers are beginning to expand their warehouses and more bookstores are being opened.

Amazon. (2009). Say Hello to the Kindle DX. Retrieved from http://www.amazon.com/Kindle-DX-Wireless-Reader-3G-Global/dp/B002GYWHSQ.

Amazon created the Kindle as an e-reader unique to their American marketplace. They are already one of the largest online retailers.

This page is the where the Kindle DX is available for purchase. The item description details everything a consumer may want or need to know before purchasing the e-reader.

The Kindle DX has e-ink, meaning its display mimics that of a paper with clear text. Since the screen is not backlit or LCD, it can be used in the sun without a glare. Users are able to access books in 60 seconds or less from a large selection; the wireless Internet connection also means users do not need to be connected to a computer to get the books, but purchases can be synced. In addition to low book prices, users also have access to free book sample and free books from the public domain. The Kindle DX has a built-in PDF reader, so it can display files of other formats. The Kindle DX can read to users, and it has screen that rotates automatically when the device is turned. The battery life can last up to a week with the wireless access turned on, and it can last up to two weeks with the wireless access turned off. The Kindle DX is slim, measuring at one-third of an inch, which is the equivalent of the average magazine.

Anson, C.M. & Schwegler, R.A. (2012, September). Tracking the Mind's Eye: A New Technology for Researching Twenty-First-Century Writing and Reading Processes. *College Composition and Communication, Volume 64, No. 1*, 151-171. Retrieved from http://www.jstor.org.proxy.bsu.edu/stable/23264924.

Chris M. Anson is the director of the Campus Writing and Speaking Program at North Carolina State University, and Robert A. Schwegler is a professor in the Department of Writing and Rhetoric at the University of Rhode

Island. Their journal examines the relationship between the technology of eye tracking and reading and writing processes.

The journal is comprised of secondary research. Anson and Schwegler discuss that eye tracking creates the ability to make maps of eye movement when reading. The technology "to study human perceptual processes and gaze preferences crosses many disciplines," as it is beneficial in the fields of psychology, communications, and more.

Fixation, which is the amount of time spent on a word when reading, can be affected by the difficulty of the text, the nature of the text, and the relationship and background of the reader with the text. Reading speed is also affected by the difficulty of the text. When reading, readers tend to skip text they see as unimportant, such as common phrases, patterns, material inferred from context, words not perceived as necessary for the full syntactic elements, and peripheral elements, such as citations, in academic writing. Eye tracking also allows researchers to examine pupil dilation, which is related to cognitive functions. Analysis shows "greater cognitive demands lead to greater dilation, which provides additional insight into moments when the writer is working harder to create or interpret text" (160).

Baccino, T., Benedetto, S., Drai-Zerbib, V., Pedrotti, M., & Tissier, G. (2013, December 27). E-Readers and Visual Fatigue. Retrieved from http://dx.doi.org/10.1371/journal.provne.0083676.

Thierry Baccino is a professor of cognitive psychology and digital technology at the University of Paris VIII. Simone Benedetto is a research engineer and ergonomist in the department of psychology at the University of Vincennes; he has background in cognitive ergonomics. Véronique Drai-Zerbib has a background in cognitive psychology and works in the psychology user lab at Pierre and Marie Curie University. Marco Pedrotti is a user experience researcher at the University of Neuchâtel. Geoffrey Tissier is a graduate student at the University of Paris VIII who is studying psychology with a focus on eye tracking.

The team of researchers conducted a survey where participants had to read on two different kinds of e-readers – e-ink and LCD – and a print book. There

were twelve participants and none of them had any experience with e-readers. Their reading habits were monitored with eye tracking.

Subjective preference indicated participants preferred the paper book over either of the e-readers, and participants did not prefer one e-reader type over the other. This may be a result of habits formed starting in childhood. A decrease in number of blinks is a common sign of visual fatigue, and the number of blinks by participants only decreased when they read on the LCD screen e-reader. This suggests e-ink e-readers and print formats do not cause visual fatigue, but LCD screen e-readers do.

Band, J. (2013, November 21). The Changing Textbook Industry. Retrieved from http://www.project-disco.org/competition/112113-the-changing-textbook-industry/#.VyFx-2QrJ-V.

Jonathan Band has a prestigious legal background. While his background is diverse, his main focus was intellectual property and electronic commerce. His experience with electronic commerce matters as this report examines how the Internet is impacting the textbook industry.

The repot is the result of secondary research of the textbook industry. There are two major markets – K-12 and higher education – and five publishers have nearly all the control. However, the Internet has disrupted their traditional business practices even though it has always been part of sales.

Although there are few textbook companies so there is arguably little to no competition, textbook prices have increased 800 percent in the last 30 years. This equals out to the average students spending an estimated $900 each year. However, the Internet has offered students a chance to reduce this cost. Not only are there now sites that offer cheaper purchases, but there is also a growing platform for free textbooks. OpenStax is a growing platform that allows users access to free e-textbooks. While it currently offers very few textbooks, options are growing as the demand is growing.

Baron, N.S. (2014, July 14). How E-Reading Threatens Learning in the Humanities. Retrieved from http://chronicle.com/article/How-E-Reading-Threatens/147661/.

Naomi S. Baron is a professor of linguistics and the executive director of the Center for Teaching, Research & Learning at American University. She is a published author who focuses on how reading in digital formats affects overall comprehension.

Baron's research discussed in this article was very survey based. The survey explored reading preferences of university students in the United States, Germany, and Japan.

The most relevant of Baron's findings include cost and length both affect the choice between digital and print. 90 percent of the sample preferred a hard copy for schoolwork, and 92 percent would choose a print copy if the text is long. Baron also discovered some students read more carefully with digital rather than print, even having one student and survey participant note they dislike the fact that reading print takes longer because they have to read more carefully.

Barzillai, M. and Wolf, M. (2009, March 1). The Importance of Deep Reading. ***Educational Leadership, Volume 66, Issue 6.*** **Retrieved from https://www.mbaea.org/documents/resources/Educational_Leadership_Article_The__D87FE2BC4E7AD.pdf.**

Mirit Barzillai is a doctoral candidate studying child development. Maryanne Wolf is a professor of child development at Tufts University and director of the Center for Reading and Language Research. They argue reading is not a natural part of human nature, but rather a learned behavior.

Barzillai and Wolf's report contains secondary research about deep reading, which is "the array of sophisticated processes that propel comprehension and that include inferential and deductive reasoning, analogical skills, critical analysis, reflection, and insight." There is a fear that readers will be unable to read deeply when reading digital formats or online.

Digital reading calls for a different reading circuit, meaning it uses a different part of the brain when reading. A reading circuit for deep reading can be prompted as a result of digital reading, but it will take further time and training. Deep reading is important to dedicate the time to as it can help maintain the benefits of thought evoked from print reading in a world dominated by digital reading. If readers do not challenge themselves to engage in deep thought while

reading, then the results for future thought could be detrimental. Skimming does not completely mean it is impossible to read deeply, but it does mean readers need to choose the right words to read and further investigate. Reading successfully is not going to happen overnight, and it needs to be worked at regularly to maintain deep reading processes.

Boch, F. and Piolat, A. (2005, September). Note Taking and Learning: A Summary of Research. *The WAC Journal, Volume 16.* Retrieved from http://wac.colostate.edu/journal/vol16/boch.pdf.

Françoise Boch is a lecturer of linguistics and literacy at Stendhal University. Annie Piolat is a professor emeritus of cognitive and experimental psychology at the University of Provence.

Boch and Piolat combined their backgrounds to investigate how students take notes and what the implications of their note taking habits are. Through secondary research, the specific topics they researched were the functions of note taking, how notes are taken, how note taking affects understanding and learning and how students can be taught to take notes.

Note taking is an information-processing tool. It exists as a way for people to record information, and their notes aid in reflection. It helps makes stronger connections and helps build long term memory. The average writing speed is 0.3 to 0.4 words per second, which is much slower than the average 2 to 3 words per second that are spoken. Because of this, many students develop shorthand to help them keep up as their take notes. Reworking these notes later is also considered to be a learning tool.

Carr, N. (2013, February 20). Students to e-textbooks: no thanks. Retrieved from http://www.roughtype.com/?p=2922.

Nicholas Carr is a freelance writer who focuses on technology, culture, and economics. He is also the author of four books, most of which are notably about the evolving relationship of technology and users.

Carr wrote this blog post about the stereotype that students today prefer print over digital and how it is incorrect. While the blog post is his opinion, it does include valid information from secondary research about student preferences.

Carr focused on analyzing a study completed by the Ryerson University in Toronto. They surveyed students who use both print and e-textbooks. Students said they felt advantages of print textbooks were they have "fewer distractions" and they encourage deeper study because students "are able to study longer with less physical and mental fatigue (Ryerson University). Students also liked highlighting and annotating in print textbooks better than in e-textbooks and how print textbooks were more easily accessible than e-textbooks. The results indicate digital natives prefer print.

Catalano, F. (2015, January 18). Paper is back: Why 'real' books are on the rebound. Retrieved from http://www.geekwire.com/2015/paper-back-real-books-rebound/.

Frank Catalano has extensive experience within the consumer and education technology industries. He works as an analyst and strategist.

Catalano's report analyzes the relationship between print and e-textbooks, particularly looking at sales and preferences. The report is composed of seconday research.

According to Nielsen BookScan, the number of paper books sold at Amazon and other bookstores increased 2.4 percent in 2014. This coincides with *Publishers Weekly*'s report that print books are selling better now than they have since e-books grew in popularity, recovering from their lowest sales numbers in 2012. The sale of e-books has slowed, but they still make up 27 percent of all book sales in the United States. Students' purchasing power is reflective of their preferences as well, as studies suggest students prefer print over digital, particularly among students who have used both. Hewlett-Packard's study found 57 percent of students prefer print textbooks and only 21 percent prefer e-textbooks. A major contributing factor for students preferring print is they feel they comprehend more than when reading e-textbooks. Eye tracking studies suggest users skim screens, but they read line-by-line on print, forcing more time and effort to aide understanding. Additionally, other studies have found e-textbook users skim the text aspects just to get to the interactive parts of the books.

Chaparro, B., Gillett, C., and Jardina, J. (2016, January 23). How Are College Students Using E-Textbooks? Retrieved from http://usabilitynews.org/how-are-college-students-using-e-textbooks/.

Barbara Chaparro and Jo Jardina worked with the Software Usability Research Lab at Wichita State University. No further information about C. Gillett could be found.

Chaparro, Gillett, and Jardina conducted a survey of 355 students. The students were asked if they had used e-textbooks before, and, if so, how they used the e-textbooks, how they accessed them, what applications were used, and how often they used the applications.

In a previous survey conducted in Fall 2013 by the Software Usability Research Lab, only 53 percent of students had used an e-textbook at some point, and, to access them, 73 percent were using desktop or laptop computers, 37 percent used a tablet, 20 percent used a cell phone, and 15 percent used an e-reader. However, in the more recent survey conducted in Spring 2015, 75 percent of students had used an e-textbook. To access e-textbooks, 75 percent of students said they use a desktop or laptop computer, 51 percent said they used a tablet, 31 percent said they used a cell phone, and 16 percent they used an e-reader. Since fewer students were using e-readers, more students are using applications to access e-textbooks on tablets. However, none of the applications students said they used earned a high enough score on a usability test to indication satisfaction with the application. Students like the convenience, ecological benefits, lower cost, and searching capabilities of e-textbooks. Some students also liked additional features of applications, such as quizzes, links, additional problems, and other interactive features. However, students said they felt they could not depend on e-textbooks for academic reading for fear of a dead battery, Internet connectivity issues, or not being able to turn pages with ease. Students also complained it was difficult to highlight, to learn and retain information, and take notes and to read, noting it was difficult to read for long periods of time due to eyestrain and headaches. Although some students liked the additional features of applications, some felt they could be distracting.

Christenbury, L. & Kelly, P.P. (1994, March). What Textbooks Can—And Cannot—Do. *The English Journal, Volume 83, No. 3*, 76-80. Retrieved from http://www.jstor.org/stable/820933.

Leila Christenbury and Patricia P. Kelly both were professors of English at a variety of universities. Their article explores the importance of textbooks as well as the pitfalls of the textbooks.

The article is a combination of personal experience and observation as well as surveys of other teachers. They researched the benefits of textbooks and how they can be beneficial to learning, but they also found what teachers found to be troubling about using textbooks.

Textbooks were agreed to be convenient, cost effective, a sense of authority, helpful in using time efficiently, and a way to maintain control over what some teachers include in their lessons. They have the ability to "define, codify, and organize," and physical textbooks "look and smell official, like the real thing, as if serious stuff will be going on in those classes" (77). However, most teachers believe them to be just a starting point for learning. One teacher noted "we can't create everything – we can *start* with texts" (78).

Comden, D., Davis, K., Giacomini, C., Haaland, W., Lyle, H., Wallis, P. (2013, November). The Current State and Potential Future of E-Textbooks. Retrieved from https://library.educause.edu/~/media/files/library/2013/11/elib1304-pdf.pdf.

The authors of this study all work at the University of Washington. Cara Giacomini works in information technology research, Peter Wallis and Keesha Davis are instructional technologists, Henry Lyle works in user research experience research, and Dan Comden works in accessibility and assistance technology. Their research was a review of the e-textbook pilot program of the University of Washington, complete with surveys of student participants.

The first pilot program at University of Washington was in 2009 and focused on Kindle e-readers, but students did not like the reading experience or the tools used to take notes. Their second pilot program was conducted in 2012-2013 focused on online e-textbook platforms Courseload and CourseSmart instead. Seventeen instructors in twenty courses used the e-textbook platforms,

and 1,859 students participated in the program. Thirteen instructors and 728 students provided feedback about the e-textbooks after using them for the entire semester.

College students today are considered to be "digital natives," and while they may not necessarily like digital textbooks, they expect to encounter them after they leave high school. These e-textbooks allow professors to keep material current for students as they can alter and enhance content. Students reported they felt they read somewhere between active and passive, and between intermediate and nonsocial. This means there likely was some highlighting, outlining, and note taking, and they did not discuss or share content with each other very much. However, students said their e-textbook experiences were below their expectations in terms of price, innovation, mobility, accessibility, and integration. Textbook companies need to make sure the price of the textbook is adequately reflected in the value of the text, especially enhancing digital features that are not capable in a traditional print text. Students like they can search, share, and cross-reference content in e-textbooks, so it is essential textbooks use these tools effectively. E-textbooks need to be available anytime anywhere for anyone, and the e-textbook needs to be part of a much larger learning ecosystem.

deNoyelles, A., Raible, J., and Seilhamer, R. (2015, July 6). Exploring Students' E-Textbook Practices in Higher Education. Retrieved from http://er.educause.edu/articles/2015/7/exploring-students-etextbook-practices-in-higher-education.

Aimee deNoyelles, John Raible, and Ryan Seilhamer are all faculty members at the University of Central Florida. They are all Instructional Designers at the Center for Distributed Learning.

This research team worked to investigate how students use e-textbooks. The conducted two surveys – one in 2012 and one in 2014 – to see how students use the e-textbooks and how their usage may have changed over time. The survey in 2012 was administered to 809 undergraduate and 133 graduate students in 84 courses in 12 different colleges. In 2014, the survey was administered to 1,075 undergraduate and 106 graduate students in 83 courses in 12 different colleges.

In 2014, 60 percent of students said they had used an e-textbook at least once while in college, which was an 18 percent increase from what students said in 2012. In both surveys, students said lower cost was the top factor in choosing an e-textbook over a print textbook. Also, students used computers to access e-textbooks the most across the years, but tablet usage increased from 12 percent to 17 percent from 2012 to 2014. Students said they like e-textbooks because they are "easy to use…[and they] appreciated cost, accessibility and features." However, most of them were dissatisfied with their experiences. E-textbooks are a non-standard platform with limited use by students and the role of instructors is often unclear in the adoption process. Most students said they wanted instructors to annotate and work with the textbook more. If instructors spent more time with and on the e-textbooks, it is possible students could prefer digital to print, but students still steadily prefer print for now. Students said they want instructors to be more upfront about digital options, though, as long as they are available across all devices. It is also important that e-textbooks "aid learners in the reading experience by enhancing content in diverse ways." The construction of e-textbooks affects digital reading; students favor highlighting and annotating tools, but they rarely annotate the texts. The annotation issue spreads to instructors, as previously mentioned. However, professional development on how to use the tools that entice students to use e-textbooks could help alleviate the situation.

Duran, K.S. and Frederick, C.M. (2013). Information Comprehension: Handwritten vs. Typed Notes. *Undergraduate Research Journal for the Human Sciences, Volume 12.* Retrieved from https://www.kon.org/urc/v12/duran.html.

Karen S. Duran was a psychology student at Sierra Nevada College. Christina M. Frederick is the Program Chair of Psychology at Sierra Nevada College. This research project was completed by Duran under the advisement of Frederick to investigate the advantages and disadvantages of handwritten versus typed notes.

Duran and Frederick used secondary research to investigate what is already known about how students take notes. From there, they set up a study to compare handwritten versus typed notes. There were 72 undergraduate students

who participated in the study. Students viewed a documentary and chose to take notes by hand or on a laptop.

In this study, handwritten notes were better for facilitating information from the documentary. Students preferred them as well. Although students who used laptops to take notes did not perform poorly, those who took notes by hand did better. It is important that computers are not the only tools used in the classroom because they may limit learning. If computers are used in the classroom, it is important the experience of using them is different from the experience of taking notes on paper. Students choose the method they choose because they want a diverse experience.

EDUCAUSE. (2010). 7 Things You Should Know About E-Readers. Retrieved from https://net.educause.edu/ir/library/pdf/ELI7058.pdf.

EDUCAUSE is a non-profit organization of technology leaders and professionals working to improve higher education.

EDUCAUSE prepared the informational document based on secondary research on a variety of topics about e-readers. Topics include what e-readers are, how they work, who is using them, why it matters that people are using them, the disadvantages of e-readers, the future of e-readers, and how e-readers will affect teaching and learning.

E-readers are devices specifically designed and created to display digital versions of printed sources, such as books, magazines, and newspapers. Some have Internet capabilities as well. There are different kinds, including e-ink, which is similar to newspaper print, and LCD screens. Students are increasingly using them more, and e-textbook company CourseSmart said their e-textbook sales increased 400 percent in 2009. The increasing use of e-readers and e-textbooks matters because it has a direct effect on education. As technology evolves, expectations of textbooks are changing. E-readers and e-textbooks allow instructors to manipulate content and keep it current for their students. E-books can also offer cheaper alternatives to print versions.

Erdmann, N., Heimonen, T., Keskinen, T., Mikkilä-Erdmann, M., Raisamo, R., Saairnen, S., Turunen, M., Yrjänäinen. (2015, October 4). Identifying User

Interaction Patterns in E-Textbooks. *The Scientific World Journal, Volume 12*. Retrieved from http://dx.doi.org/10.1155/2015/981520.

These contributors all worked in either the School of Information Sciences at the University of Tampere – Kanslerinrinne or in the Department of Teacher Education at the University of Turku – Assisteninkatu. Their research examines how students interact with navigational aids in e-textbooks.

The research team developed a web application for e-textbooks called Eager. In Spring 2014, 99 students in the teacher education program at the university utilized it and participated in evaluation sessions. The application tracked how users clicked, when they clicked, and what they clicked.

Different user types resulted from different interaction sequences: passive user, term clicker, and concept map user. The navigation map helped users figure out the application more quickly, and they also used the application longer and interacted with the e-textbook. This indicates that "using tools such as concept maps, or other visual aids in combination with e-texts, would improve the perceived usefulness of an e-learning application" (10). While there was not necessarily a direct effect on learning outcomes, students were more interested in learning when these elements were involved, which could hypothetically lead to more excited students and more long-lasting concepts.

EyeTracking, Inc. (2011). About Us: What is EyeTracking? Retrieved from http://www.eyetracking.com/About-Us/What-Is-Eye-Tracking.

EyeTracking, Inc. was founded by Dr. Sandra Marshall and some of her colleagues from the Cognitive Ergonomics Research Facility at San Diego State University. The organization was founded in 1999 and has pioneered new technology within the eye tracking field.

This article explains eye tracking in layman's terms. It addresses the process of eye tracking, what the data gathered means, and how eye tracking can be applied. As EyeTracking, Inc. is a leader in this aspect of technology, much of this is their own research or common knowledge from their employees.

Eye tracking measures eye activity, such as where people look, how often people blink, how the pupil reacts to stimuli, and more. There are two ways to collect eye tracking data; a device connected to a computer is necessary, but it can

be remote or attached to the head of the user. The process includes a light source and a camera; the camera tracks the reflection of light, which is a major indicator of whatever is monitored. The data is input into software programs for further examination. Eye tracking has the ability to not only show how people read or interact with content, but also improve daily life. It can provide insight on how to make daily activities safer, open new doors in terms of psychology and physiology, change design, and more.

Free, K.K. (2015). What is an eTextbook? Retrieved from http://www.bellaonline.com/articles/art31631.asp.

Kathryn K. Free is a guest author for BellaOnline. No further biographical information is available.

Free's article is an analysis of different types of textbooks. She focuses on what e-textbooks are and their implications on learning can be.

While some e-textbooks have additional features to differentiate themselves from print versions, they are essentially electronic versions of the same print book. Students have the ability to purchase them, but there are also subscriptions or monthly rentals available. A growing option for students are open source textbooks, which are free e-textbooks available online.

Gallagher, J. and Jassmond, B. (2013, May 23). Designing and Evaluating an Interactive eTextbook for RBE1001. Retrieved from https://www.wpi.edu/Pubs/E-project/Available/E-project-051313-152307/unrestricted/DesigningAndEvaluatingAnInteractiveETextbook.pdf.

Bryce Jassmond completed this project in pursuit of earning a Bachelor of Science degree from Worcester Polytechnic Institute. Jassmond designed an interactive e-textbook for a common class at the school. Joseph Gallagher assisted Jassmond with his project by writing the literature review and methodology sections. The information in the literature review were most applicable to this research project.

Before designing the e-textbook, Jassmond and Gallagher completed research secondary research about textbook design and usage. Their research covered both print and e-textbooks. The e-textbook section addressed the growth and potential of e-textbooks.

There was a 40 percent increase in e-textbook sales between 2008-2009. E-textbooks, on average, are 53 percent cheaper than new print textbooks. While it is important e-textbooks differentiate themselves from print textbooks to make themselves appealing, it is important they are still textbooks at their core. They need to be a cohesive document. E-textbooks should be flexible and low-cost to deliver. They are non-static, which allows instructors to edit them. Most students said they use textbooks for homework, assigned reading, and to study, and they frequently read and use supplemental materials, like practice problems, in e-textbooks, and they liked the additional features. Students also said they liked the portability, inexpensive cost, and ease of use of e-textbooks, but they did not like the dependency on technology e-textbooks caused them, how e-textbooks made them read differently, and the e-textbooks made them dependent on Internet access. However, students like physical print textbooks because they are easier to read, easier to take notes in, and easier to track for future use.

Goodin-Smith, O. and Rader, D. (2015, January 17). Students break the bank to buy their books. Retrieved from http://college.usatoday.com/2015/01/17/students-break-the-bank-to-buy-their-books/.

Ooana Goodin-Smith is a student at Oakland University and Daniel Rader is a student at Ohio University. Both students were 2015 *USA TODAY* Collegiate Correspondents.

The article is an investigation into the high costs of textbooks college students deal with. It includes data from secondary research as well as personal details from interviews as part of primary research. The journalists look at the prices of textbook and software bundles as well.

The journalist found that for a 16 credit hour semester, the some students spend $900 on required textbooks and an additional $200 on required materials. In 2014, the average student spent $1,200 annually on textbooks. This is equivalent to 39 percent the cost of tuition and fees at a community college and 14 percent the cost of tuition and fees at a four-year university. While combination bundles of software and digital textbooks may seem like a solution to the digital versus print argument, they can often be expensive. An example bundle cost a student $244.

Groner, R., Siegenthaler, E., and Wurtz, P. (2010, November). Improving the Usability of E-Book Readers. *Journal of Usability Studies, Volume 6, Issue 1,* 25-38. Retrieved from http://uxpajournal.org/improving-the-usability-of-e-book-readers/.

Rudolf Groner, Eva Siegenthaler, and Pascal Wurtz all work for the Institute for Research in Open-, Distance-, and eLearning at Swiss Distance University. The study investigates the legibility and usability of e-readers.

The study tested a variety of tools and features of e-readers. There were ten participants of different genders, ages, and education levels. Each participant was given an e-reader as well as a list of tasks, which they were supposed to report if they were able to complete as well as rate the difficulty of completing the task. Participants also wore eye tracking devices to monitor their reading speeds.

Participants ranked classic paper books first in design, navigation, functionality, and usability. The only section that classic paper books were not ranked first was handiness. This suggests there is still a preference for print over digital in all regards except for the convenience e-readers and e-books can offer. This means e-readers cannot completely replace print books, at least not yet as their usability needs improvement. However, e-readers are not all bad; users just need to first consider why they are buying the device and what aspects matter most to them.

Herold, B. (2014, May 7). Digital Reading Poses Learning Challenges for Students. *Education Week, Issue 33,* 24-25. Retrieved from http://www.edweek.org/ew/articles/2014/05/07/30reading_ep.h33.html.

Benjamin Herold is a writer for *Education Week* who focuses on education technology.

Herold conducted secondary research as well as interviews with educators regarding the responses to the combination of print and digital formats in the classroom. One of the main focuses was on the added features the digital format may offer.

There is not enough conclusive data to say with absolute certainty that one method is better than the other. However, print offers fewer distractions and can often keep students more on-track with their research. Additional digital features

are preferred when they complement the traditional text, are easy to follow, and blend with reader preferences. As some schools try to make the switch from print to digital, they are met with some resistance from students, so educators are working to blend the options together so students can benefit from both formats. One student said he prefers reading on digital over print, but he understand more when reading paper "because it's all right there, and it's not skipping ahead and back all the time."

Itzkovitch, A. (2012, April 12). Interactive eBook Apps: The Reinvention of Reading and Interactivity. Retrieved from http://uxmag.com/articles/interactive-ebook-apps-the-reinvention-of-reading-and-interactivity.

Avi Itzkovitch is an interactive and web designer. He also works with user experience and emerging design.

This article is an investigation into how to make e-books interactive. Itzkovitch explores the best ways to make e-books interactive as well as the best features depending on the type of content.

For interactivity to be effective, it needs to be purposeful. Itzkovitch warns against interactivity for the sake of interactivity. Instead, it should enhance the reading experience by interacting with the storyline and content. It is essential the content is interactive – not just the e-books themselves. Effective interactive content involves an integration of video, audio, and other interactive elements that engage users. Other features include graphics, images, and animations.

James Madison University. (2016, January 8). E-textbooks Effectiveness Studied. Retrieved from http://www.psyc.jmu.edu/ug/features/etextbooks.html.

James Madison University's Department of Psychology prepared this article based on research completed by two of their professors: David Daniel and Krisztina Jakobsen.

Daniel and Jakobsen conducted a study to investigate how students read e-textbooks. They also surveyed students to discover what they like and dislike about e-textbooks, especially in comparison to print textbooks.

A common argument in favor of e-textbooks is they are affordable. For example, the new hardcover print version of a psychology book costs $144 and the used paperback copy costs $95, but a Kindle version is available for only $88.

This is beneficial to e-textbook publishers, but may hurt students. Students benefit only economically, but the disadvantages of e-textbooks could force low-income students to have to use a lesser product. However, some students do not care about the economic advantages of going digital. In a 2008 survey conducted by the Student Public Interest Research Group, 60 percent of students said they would purchase a low-cost print textbook even if the digital version is offered for free. In previous research conducted by Daniel, students said they would likely purchase a print textbook in addition to using an e-textbook that was offered for free. Students may not necessarily see the use in paying for an e-textbook as they are not always likely to utilize the additional features they provide because they care more about finishing reading than engaging with hyperlinks and embedded multimedia feature. Reading from e-textbooks also takes longer because students said they took more time and effort to read to reach understand and they felt there were more distractions present than with print textbooks. This does not mean interactive elements are what students are looking for when reading, it does not mean they do not want them ever. "When [students] are reading, they want to finish reading, and when they are studying, they go straight for key words and tutorials because they want to review" (Daniel). In addition to offering their opinions, students read e-textbooks on monitors with the capability to track their eye movements. Students were reading in more scattered formats on the screen than the traditional line-by-line patterns of reading print. Although some students who read the e-textbook scored similar comprehension scores as those who read the print textbook, these habits of reading digitally can be ineffective for studying as "too much information gets lost, causing the reader to have to reread sections as they check for understanding." However, "reading and studying are different activities for many students, and [textbook companies] should be designing products that recognize that" (Jakobsen). While it is a process to help readers adapt to reading online, it is important publishers work to make a product that benefits students, their preferences, and their learning habits.

Kozlowski, M. (2010, May 17). A brief history of eBooks. Retrieved from http://goodereader.com/blog/electronic-readers/a-brief-history-of-ebooks.

Michael Kozlowski is the editor in chief of Good e-Reader, a website dedicated entirely to technology. He has written about e-readers and technology for four years.

This article is a timeline outlining e-books, starting with their first appearance and their evolutions through 2010, when the article was written.

The first e-book debuted in 1998. However, they gained little momentum, as print was still preferred and e-books were predicted to be a failure, leading Barnes & Noble to terminate sales of e-books in 2003. In 2004, a new e-reader featuring e-ink was introduced, being the first e-reader with the screen format that mimicked real paper. Amazon introduced the Kindle in 2007; it was an e-reader released exclusively for the American market and the first production sold out in five and a half hours. This marked a new wave as more e-readers from a variety of tech giants developed their best bet at competing with Amazon. On December 25, 2009, e-books outsold print books for the first time. As more e-readers were released, more digital markets came about to compete with Amazon. One of the biggest competitors became Apple's iBookstore, which accompanied their new iPad in April 2010. More than half a million e-books were sold on iBookstore in less than a month, indicating e-books were on the rise and here to stay.

Liu, Z. (2003, August 12). ***Perceptions of credibility of scholarly information on the web.*** **Retrieved from doi : 10.1016/S0306-4573(03)00064-5.**

Ziming Liu is a professor of library and information science at San Jose State University. This study examined how people, particularly students, perceive credibility of websites.

A survey was distributed to examine the different attributes of web pages that could make the site seem more credible to users. Participants were to rate how things like design, references, and more enhance their perceived credibility of the website.

The most relevant finding from this study was students believe pieces published in scholarly journals are more credible. Not only does this show that students do value the additional review of the articles, but it also alludes to the idea that something that is in print is more credible than something that is online.

Liu, Z. (March 2006). Print vs. electronic resources: A study of user perceptions, preferences, and use. ***Information Processing & Management, Volume 42, Issue 2.*** **Retrieved from http://www.sciencedirect.com/science/article/pii/S030645730500004X.**

Ziming Liu is a professor of library and information science at San Jose State University. This study examined graduate student preferences of print or digital media.

Liu conducted his research through a survey of graduate students. The results of the survey were compared with those of undergraduate students as well as previous research.

From previous research, Liu noted that 73 percent of 83 graduate students surveyed preferred electronic journals to print journals because of enhancements such as links to more information, ability to search, currency of information, availability, and easy accessibility. In his own research, Liu found that 84.2 percent of graduate students surveyed said they use electronic resources "all the time" or "most of the time," and only 54.2 percent said they use print sources "all the time" or "most of the time." Although many preferred electronic resources because of their general convenience, an average of 80 percent of students across programs said they "always" or "frequently" print out electronic documents. They found reading print to be less distracting, but there was a preference for the additional resources electronic provided, such as links to further information. Although there are some annotation tools available on e-textbook and digital formats, it is likely students will continue to print out items to annotate on paper instead of digitally. The paradox of preferences suggests the best method in the future is a mixture of print and digital resources as long as the supplement each other.

Love, J. (2012). Reading Fast and Slow: The Speed at Which Our Eyes Travel Across the Printed Page has Serious (and Surprising) Implications for the Way We Make Sense of Words. ***American Scholar, Volume 81, Issue 2.*** **Retrieved from https://theamericanscholar.org/reading-fast-and-slow/#.Vsw41HQrK8U.**

Jessica Love has a doctorate in cognitive psychology. Her study in this journal focuses on the implications of the speed at which a person reads.

This journal was predominately based on secondary research. The basis for comparing reading speeds is the concept of fixations, which is the amount of time the eye spends looking at letters on a page. An average fixation allows the eye to take in four letters to the left and 15 letters to the right of a specific fixation point. Most fixations are 200 to 300 milliseconds.

There is a slow reading trend accompanying the trend of rushing to read fast as readers are choosing to slow down to contemplate information. However, how much a person enjoys reading can affect their reading speed; these readers are able to skim pages, reading quickly but still contemplating what they read. The average person reads about 250 words per minute, but math and skimming styles suggest some people can read up to 500 words per minute. Aside from associated knowledge with fixations and their implications, a problem with many reading speed studies is they do not test comprehension, so there is not necessarily concrete evidence that reading quickly damages understanding. One study, however, did examine how speed reading can affect comprehension, and most participants were able to recall general information about what they read, but failed to provide answers about minute details. This was likely a result of selectively reading passes as they read because reading quickly includes making fewer fixations, which can lead to misreading words or skipping them all together. Skimming can be combated with some prior knowledge, as it is selective and readers choose to read what they see as important and skip over what is not. If there is no prior knowledge, design can be an indicator of what information is most important. E-books present different challenges traditional psychological patterns of reading, and one of the biggest issues is interruptions. However, distractions are not new and exclusive to print, and deep reading has been stymied. It is important for readers to work to read carefully and adapt to new reading environments and patterns.

Marmarelli, T. & Ringle, M. (2010, February 26). The Reed College Kindle Study. Retrieved from http://www.reed.edu/cis/about/kindle_pilot/Reed_Kindle_report.pdf.

Trina Marmarelli is an instructional technologist at Reed College, and Martin Ringle was chief technology officer and is now the chief information officer at Reed College. Reed College was part of the Amazon-sponsored study of how their new Kindle DX e-reader fit into an academic setting.

Reed College selected three upper-level undergraduate classes in different areas: French, English, and political science. Students in the courses were each given a Kindle DX upon an agreement to complete surveys, participate in discussions, and respond to related emails.

Students responded positively to the legibility, durability, convenience, and ecological benefits of the e-readers. However, some readers had issues with formatting and PDF or document availability. Students disliked how slow the e-readers were and found it difficult to refer back to specific passages. It was difficult for students to annotate and take notes, which affected comprehension. A professor noted he believed his students read more passively and comprehended less as a result of the e-readers, which was backed up by weaker class discussions and poor assignment performance. The potential savings were not enough to convince students; most noted the price would need to drop well below $100 to entice them to commit to a Kindle DX.

May, C. (2014, June 3). A Learning Secret: Don't Take Notes with a Laptop. Retrieved from http://www.scientificamerican.com/article/a-learning-secret-don-t-take-notes-with-a-laptop/.

Cindi May is a psychology professor at the College of Charleston. She studies ways to optimize the cognitive functions of college students, adults, and people with intellectual disabilities. May also focuses on ensuring education tools are inclusive for those with intellectual disabilities in higher education.

May's report is the culmination of secondary research. She examines experiments investigating the advantages and disadvantages of handwritten and typed notes. May focuses on implications note taking style may have on learning and understanding.

Students type faster than they write, so they tend to take more notes when they type than they do when they are handwriting their notes. However, students who write out notes by hand learn more (Mueller and Oppenheimer). This habit

builds stronger conceptual understanding, so students become better at applying and integrating material if their notes are taken by hand. This could be attributed to the fact that taking notes by hand utilizes a different cognitive process than typing them, as handwriting notes forces students to listen to information, digest it, and then summarize it, whereas students can mindlessly transcribe information when typing notes on a laptop. Students participating in the study were given tests right after learning the material and a week later, and students who took notes by longhand rather than with a laptop performed better both times. Students who take notes by longhand have the advantage of taking notes that are more in their own words as well as their own handwriting, which help establish memory cues. Many students said they did not use the outlines they were provided, which falls in line with the idea that "even when technology allows [users] to do more in less time, it does not always foster learning" (Mueller and Oppenheimer).

Meyer, K. (2016, January 3). Millennials as Digital Natives: Myths and Realities. Retrieved from https://www.nngroup.com/articles/millennials-digital-natives/.

Kate Meyer works for the Nielsen Norman Group as a User Experience Specialist. Her background is in information theory and design, and she works in user research, which helps with strategy and implementation for websites and applications.

In her article, Meyer conducted secondary research to debunk myths about Millennials and their relationship with the digital world. According to Meyer, three of the biggest misconceptions about Millennials are they have inferior social skills or are more likely to avoid personal interaction in favor of digital interaction, they are much better multitasking than digital immigrants, and they have natural instincts about how to use or fix computers and other digital prodcuts (3).

Meyer defines a Millennial as "someone who became an adult around the year 2000," or those born between the 1980s and the 2000s, mean their between age 16 to 36 in 2016 (1-2). They are considered digital natives, which are people who were "raised in a digital, media-saturated world" (2). While Millennials are more likely to multitask, it does not necessarily mean they are good at it as it

increases the cognitive load, which can force people to pause and reconsider before pursuing any new tasks. Further, the context switching which is commonly a result of cognitive overload is correlated to higher stress levels in college students (4). As Millennials did grow up in a digital world, they are much more used to digital interfaces, but they are also much quicker to criticize an interface as well as its organization and designer. Millennials are growing older, and becoming adults means purchasing power, which means they are worth time and attention.

Nawotka, E. (2012, September 11). Are College Students Buying Required Textbooks? 75% in US Say No. Retrieved from http://publishingperspectives.com/2012/09/are-college-students-buying-required-textbooks-75-in-us-say-no/#.VyFo4WQrJ-V.

Edward Nawotka is a critic, essayist, speaker, educator, and consultant for various businesses and institutions. His areas of expertise are the global publishing and content industries.

This report includes the results of a global survey of more than 10,000 students. The survey was conducted by Bookboon.com and completed by students in the United States, the United Kingdom, the Netherlands, Germany, and Denmark. Students were found by the Bookboon newsletter and Facebook page, and the survey itself was eleven questions.

In 2011, students spent approximately $655 annually on textbooks. Seventy five percent of students in the United States said they do not buy textbooks because they are too expensive and students do not use them enough to justify the price. Because of the high prices, students are seeking cheaper alternatives. Sixty percent purchase used textbooks and 16 percent borrow or rent textbooks in comparison to the 25 percent who buy new textbooks at full price. However, in the United States, 58 percent of students said they prefer the option of digital textbooks because they are easier to carry and read, and there is a possibility they are cheaper.

Niccoli, A. (2015, September 28). *Paper or Tablet? Reading Recall and Comprehension.* Retrieved from http://er.educause.edu/articles/2015/9/paper-or-tablet-reading-recall-and-comprehension.

Anne Niccoli designs and develops curriculum and training programs for the U.S. Coast Guard. One of her specialties is working with blended learning to incorporate various learning types, which this article explores.

This article uses secondary research to provide a foundation regarding the differences between paper or digital reading. The study conducted for the article included randomly assigning groups to read the same material either in print or on a tablet and then take a quiz of multiple choice and short answer questions.

There was no statistically significant difference between the group means of test results from the different reading styles. Although there was no difference in group means, there was still a chance in differences among individual scores. However, in terms of questions measuring comprehension, paper readers did better on both multiple choice and short answer questions.

Nicholls, N.H. (2010, January). The Investigation into the Rising Cost of Textbooks: A Background Study of the Context of Michigan Initiatives with an Eye Toward Launching a Library-based College Textbook Publishing Program. Retrieved from http://www.lib.umich.edu/files/SPOTextbookBackground.pdf.

Natsuku Hayashi Nicholls is a research specialist, data curator, and associate library. Her research topics cover a wide range of topics. The intention of this report was to examine the textbook market and how it is evolving, especially with the increasing presence of digital textbooks.

The report was compiled following secondary research with a focus on how and why textbook prices are increasing, what the government is doing about textbook prices, and what the presence of e-textbooks means to this ever-changing market.

Families spend an estimated $6 billion on textbooks and supplies for college students. In 2006-2007, the average four year undergraduate student was spending $942 on textbooks and supplies, and the amount has only continued to increase. An issue identified was many faculty members have a tendency to choose and assign a textbook without without much regard to cost. Only 66 percent of faculty said they were away of the price of the materials they assigned. E-textbooks could possibly help alleviate these issues as the digital format of a

textbook can sometimes cost 50 percent less than the retail price of a conventional print textbook.

Nielsen, J. (2006, April 17). F-Shaped Pattern For Reading Web Content. Retrieved from https://www.nngroup.com/articles/f-shaped-pattern-reading-web-content/.

Jakob Nielsen has a Ph.D. in human-computer interaction. He is one of the leaders in the usability movement. In this study, he investigates how people read on the web.

The Nielsen Norman Group conducted an eye tracking study to examine the different reading patterns of diverse users. The study had more than 200 participants, and they looked at thousands of different web pages.

The dominant reading pattern is an F pattern. This pattern begins with a horizontal movement across the upper content, then is furthered with another, much shorter, horizontal movement a little bit down the page, and is concluded with scanning down the left side of the content in a vertical movement (1). The F shape is a rough, general shape, and it demonstrates that users won't always read texts thoroughly. This means to convey the most important information first, and subheads and bullet points help guide readers to other important information.

Nielsen, J. (2008, May 6). How Little Do Users Read? Retrieved from https://www.nngroup.com/articles/how-little-do-users-read/.

Jakob Nielsen has a Ph.D. in human-computer interaction. He is one of the leaders in the usability movement. In this study, he investigates how people read on the web.

Nielsen conducted secondary research to examine how people read online. He investigated reading patterns, reading speeds, and how much of pages people read.

Nielsen found, via eye tracking, that most people scan when reading online. Users spend more time on pages which have more information; Nielsen estimated 4.4 additional seconds were spent on each page for each additional 100 words. Mathematically, this results in users reading 18 percent of extended content (3). However, on an average visit, users read half the information on the a page, usually 111 words or less. In the end, readers have time to read 28 percent

of the words if they devote their time, but they are more likely to read 20 percent of the words on an average page (4).

Nielsen, J. (1997, October 1). How Users Read on the Web. Retrieved from https://www.nngroup.com/articles/how-users-read-on-the-web/.

Jakob Nielsen has a Ph.D. in human-computer interaction. He is one of the leaders in the usability movement. In this study, he investigates how people read on the web.

Nielsen conducted secondary research to examine how people read online. He investigated reading patterns as well as the kind of content users respond best to.

Nielsen found 79 percent of uses always scanned new pages first, and only 16 percent word-for-word (1). Because so few readers read every single word, it is important to make sure text is scannable. When a page had concise content, which had about half the word count of the original page, usability was at 58 percent. When text was completely scannable and organized into bullet points, usability was at 47 percent. However, by making content concise, scannable, and objective, readers had a positive response and usability was at a 124 percent. It is important to use objective language because promotional language can increase the cognitive burden, which, in turn, can make it more difficult for readers to stay focused.

Nielsen, J. (2010, July 2). iPad and Kindle Reading Speeds. Retrieved from https://www.nngroup.com/articles/ipad-and-kindle-reading-speeds/.

Jakob Nielsen has a Ph.D. in human-computer interaction. He is one of the leaders in the usability movement. This study compared average reading speed on iPads versus Kindles.

Nielsen gave 24 avid readers the same Ernest Hemingway short story to read in four different formats: iPad, Kindle, PC, and printed book. Participants were timed for how long it took to read the story on each format. A quiz was administered following each reading to check comprehension.

Participants spent an average of 17 minutes and 20 seconds reading the story, and the quiz did not indicate any significant differences in comprehension across the platforms. There was not a significant difference in reading speed

between the Kindle and the iPad, but both were significantly slower than print. The iPad was 6.2 percent slower than print, and the Kindle was 10.7 slower than print. In terms of satisfaction, all three ranked higher than PCs, but none were significantly higher than each other. Readers noted they found it more relaxing to read print text rather than electronic devices.

Nielsen, J. (2015, November 15). Legibility, Readability, and Comprehension: Making Users Read Your Words. Retrieved from https://www.nngroup.com/articles/legibility-readability-comprehension/.

Jakob Nielsen has a Ph.D. in human-computer interaction. He is one of the leaders in the usability movement. This study discussed the value of a word and how to make people read your content.

Nielsen conducted research to investigate how people read in direct relation with content usability. The aspects he examined were legibility, readability, and comprehension.

Although legibility is the lowest level of usability, it is still crucial. Readers prefer a large default font size as well as having the ability to customize font size. Contrast between characters and the background make it easier to recognize letterforms. People read at a 20 percent slower rate when there is poor legibility. When reading, it is important the cognitive load is not overloaded. This helps ensure readers can stay on task. Building on existing mental models can help minimize the cognitive load as well as remember things from one part to another.

Penny, C., Schugar, H., and Schugar, J.T. (2011). A Nook or a Book? Comparing college students' reading comprehension level, critical reading, and study skills. *International Journal of Technology in Teaching and Learning,* 7(2), 174-192. Retrieved from http://sicet.org/sicetorg/journals/ijttl/issue1102/6_Schugar.pdf.

Jordan Schugar, Heather Schugar, and Christian Penny are all faculty members at West Chester University of Pennsylvania. Jordan Schugar is an assistant professor of English, Heather Schugar is an assistant professor of literacy with an emphasis in reading, and Penny is a full professor of professional and secondary education. Together, they conducted a study to investigate the

differences in comprehension and study strategies of undergraduate students who used Nook e-readers and those who use traditional textbooks.

The study consisted of literature review, specifically that of a previous study Amazon conducted during the launch of their Kindle DX. While students noted they liked the convenience of having all of their textbooks in a more portable format, they said they found the e-reader was not suitable for fast paced environments and they comprehended less than they would have with traditional reading and study strategies. Schugar, Schugar, and Penny conducted independent t-tests with undergraduate student participants. Students were tested for comprehension via written tests to compare their ability to recall idea units and supporting idea units as well as how thorough the response was. Students were also to report how their study habits altered based on which format they chose to read with.

There was no statistically significance in the levels of comprehension between the groups of readers. Nook readers had a slightly higher level of comprehension for the control prompt. Readers did, however, note a difference in their study strategies between the reading platforms. When asked about highlighting the text regularly or daily, 50 percent of traditional readers said they highlighted, whereas only 14.3 percent of Nook readers said they highlighted. When asked about taking notes in the book regularly or daily, 28.6 percent of traditional readers said they did so, whereas only 15.4 percent of Nook readers said they did so. When asked about taking notes on a separate sheet of paper or computer regularly or daily, 64.3 percent of traditional readers said they did so, whereas only 21.4 of Nook readers said they did so.

Popken, B. (2015, August 6). College Textbook Prices Have Risen 1,041 Percent Since 1977. Retrieved from http://www.nbcnews.com/feature/freshman-year/college-textbook-prices-have-risen-812-percent-1978-n399926.

Ben Popken is a senior staff writer and editor for NBC News. He has a background in writing about monetary issues. This article is an investigative look at the drastically increasing textbook prices.

The article is compiled of secondary research on textbook prices. Not only does it address the unprecedented and continuous increasing price of textbook, but it examines what it means for students and textbook companies.

From January 1977 to June 2015, there was a 1,041 percent increase in the prices of textbooks. However, there was not much students could do about it until now. There are more options for students to rent or use free or open e-textbooks. This throws a wrench in the system that keeps students "captive customers," according to Nicole Allen, a spokeswoman for the Scholarly Publishing and Academic Resources Coalition. Allen said companies are able to keep raising prices because there is nothing students can do to combat it, especially because students need to purchase whatever textbook they are assigned. An example of a high-priced textbook is a brand new print edition of a textbook that starts at $400.

Raphael, T.J. (2014, September 18). Your paper brain and your Kindle brain aren't the same thing. Retrieved from http://www.pri.org/stories/2014-09-18/your-paper-brain-and-your-kindle-brain-arent-same-thing.

T.J. Raphael is a journalist and digital editor who examined how reading in print differs from reading digitally.

Raphael was able to reach her conclusions through literature review and interviews with experts in related fields.

Reading on screens can make one more prone to "non-linear" reading, which can lend itself to scanning and lower levels of comprehension. It can be hard for readers to train their brain to switch between the different reading and comprehension styles, especially with digital on the rise.

Reichle, E.D., Reineberg, A.E., & Schooler, J.W. (2010, September). Eye Movements During Mindless Reading. *Psychological Science, Volume 21, No. 9,* 1300-1310. Retrieved from http://www.jstor.org/stable/41062370.

All of the authors of this piece study psychology and brain patterns. Erik D. Reichle is a professor of cognitive psychology at University of Pittsburgh, Andrew E. Reineberg was a psychology student at University of Pittsburgh, and Jonathan W. Schooler is a professor of psychological and brain sciences at University of California, Santa Barbara. They study the relationship between eye movement patterns and cognitive processes.

Four undergraduate students wore eye tracking devices and read novel a novel at their own pace during a series of sessions. Participants pressed a specific key to note when they felt themselves zoning out, which was defined as any time they "realize[d] that [they] ha[d] no idea what [they] just read" or they were "not only…not thinking about the text, [they] were thinking about something else all together" (1302). In addition to the self-reporting, participants also answered questions to aide in measuring reading comprehension.

Participants answered 81 percent of the questions correctly, and they self-reported zoning out 8 to 36 times while reading. The probes caught participants zoning out 4.5 percent to 15.3 percent of the time, which means participants, on average, were zoning out 9 percent of the time without even realizing it. Zoning out is related to eye movement; most participants exhibited "more erratic patterns of eye movements" prior to zoning out, whether they were conscious of the change or not (1303). Additionally, when eye movement showed a sensitivity to more variables, it was evident they were reading more mindfully than they were reading mindlessly.

Riddell, R. (2013, January 29). 16 e-textbook providers: Who's publishing and who's selling? Retrieved from http://www.educationdive.com/news/16-e-textbook-providers-whos-publishing-and-whos-selling/94324/.

Roger Riddell is the associate editor of Education Dive. He has a background in journalism.

This article is reminiscent of investigative journalism. Riddell analyzes e-textbook companies in terms of who they are, what they are doing, and what place they play in education technology.

There are six e-textbook publishers. There are four e-textbook marketplaces. There are ten e-textbook platforms. Each of these companies offer different services as well as different content. A publisher worth noting is Pearson as they won three 2012 "Tech & Learning" Awards for three of their e-textbooks. Pearson's content is enhanced with "video, audio, assessments, interactive images and 3D animations."

Schmid, B. (2010, May 2014). Darden shares results of Kindle experiment. Retrieved from https://news.virginia.edu/content/darden-shares-results-kindle-experiment.

Beth Scmid is a senior writer with the McIntire School of Commerce at the University of Virginia. Her article recaps UVA's Darden School of Business's participation in an Amazon-sponsored trial of the Kindle DX in an academic setting. Michael Koenig, the former director of Darden's MBA operations and current senior assistant dean for degree programs, was the liaison between Amazon and Darden during the project and provided Schmid with insights on the project.

Amazon provided Kindle DXs to randomly selected first year MBA students. Students were offered the Kindles as an alternatives to traditional print textbooks and documents. The goal was to monitor how well the Kindle DX fit into a rigorous academic setting.

In a mid-term survey, 75 to 80 percent of students said they would not recommend a Kindle DX to incoming Darden MBA students for academia, but 90 to 95 said they would recommend it as a personal reading device. While many students used their Kindles to prepare for class, most students used traditional paper-based practices when in class. In response to the student feedback, Koenig said he believes "Amazon created a very well-designed consumer device for purchasing and reading digital books, magazines, and newspapers. It's not yet ready for prime time in the highly engaged Darden business school classroom."

Schugar, H.R., Schugar, J.T., and Smith, C.A. (2013). Teaching With Interactive Picture E-Books in Grades K-6. *The Reading Teacher, Volume 66, Issue 8,* 615-624. Retrieved from doi : 10.1002/trtr/1168.

Heather Ruetschlin Schugar and Carol A. Smith are assistant professors at West Chester University. Jordan T. Schugar is an instructor at West Chester University. The study investigates how digital books can have an impact on young readers.

The study utilizes secondary research to analyze e-readers and the abilities they have to enhance the reading experience. Schugar, Schugar, and Smith

investigate what makes an interactive element worthwhile as well as what students respond best to.

An advantage of e-books over print books is they can have multimodal elements such as sounds, animations, videos, and narrations. However, it is important these features are not too "seductive" as too potentially distract from the text and what is considered most important. There are three possible outcomes from seductive details: distracting from the text, supporting the text, and extending beyond the text. To be considered effective, the details should not interfere with the most important aspects of the texts.

Schwartz, K. (2012, September 14). Why College Students Still Prefer Print Over E-Books. Retrieved from http://ww2.kqed.org/mindshift/2012/09/14/why-college-students-still-prefer-print-over-e-books/.

Katrina Schwartz is a journalist and education blogger. This article is an examination of student preferences for print or e-textbooks with specific analysis of pilot programs requiring students to purchase e-textbooks for class.

The pilot program Schwartz discusses was created to investigate why students are not quickly adopting digital texts and how instructors and textbook companies can change the students' preferences. The pilot program was developed and executed at five universities during the spring semester. While students said they liked the low costs of e-textbooks, they also complained about eyestrain from reading on the screen, compatibility issues with books and devices, and overall readability problems. This falls in accordance with other studies mentioned in the article that suggest "e-books [are] not quite there yet in terms of usability, visual presentation, and navigation tools."

A particularly important complaint from students was the difficulty of using simple navigation tools such as zooming, highlighting, and annotating. Instead of enhancing learning like they should, this can actually damage it. Faculty have the ability to annotate texts for the benefit of their students, and it can actually help improve student performance, but most faculty members said they did not know how to use the features but wanted training on how to use them. These e-textbooks had the ability to be annotated, share notes with other students, and allow users to collaborate with one another, but since no one really

knew how to do it and these methods were not modeled by professors, they went unused. However, there are some students who found annotations not from the professor but rather from other students to be distracting, so this could benefit some.

Straumsheim, C. (2016, March 30). Digital Overtakes Print. Retrieved from https://www.insidehighered.com/news/2016/03/30/publishers-report-digital-sales-overtaking-print-sales.

Carl Straumsheim is a journalist focusing on technology, specifically in relation to higher education.

Straumsheim's article analyzes sales of textbook companies with a focus on comparing print versus digital sales. His research is secondary.

Multiplatform textbook company McGraw-Hill Education reported that, in 2015, their digital products outsold print products for the first time. Cengage Learning, another multiplatform textbook company, predicted their digital sales would surpass print sales in both terms of unit sales and revenue within the fiscal year. A spokesperson for Cengage suggested this indicates digital formats are continuing to catch on in higher education. There is gray area in what these high digital sales mean, though. Some companies sell access codes for e-textbooks, while others sell bundles of print and e-textbooks. Some suggest these bundles should be counted as print sales, not digital, because the print textbook is the main item and the e-textbook is merely supplemental.

The College Board. (2016). Average Estimated Undergradute Budgets, 2015-2016 – Trends in Higher Education. Retrieved from http://trends.collegeboard.org/college-pricing/figures-tables/average-estimated-undergraduate-budgets-2015-16.

The College Board is a not-for-profit organization that works to help students with the college process. They administer the Advanced Placement test and offer a variety of resources for SAT and ACT test preparation, information on how to work through the college application process, and general information on making a successful transition from high school to college.

The report is a comparison of various expenses the average college student faces at each university. It compares the costs of public, private, two-year, and

four-year schools. Additionally, it includes a further look at the average prices of textbooks and how they have changed.

At a public in-state, four-year university, the average student spends $1,298 annually on textbooks and supplies. Across all universities, the average annual spending on textbooks and supplies ranges from $1,249 to $1, 364. The prices of textbooks have increased. In 2007, the average new textbook cost $57. In 2010, the average new textbook cost $65. In 2013, the average new textbook cost $79. Also, the gap between the average cost of a new and used text book has increased from $49 to $59.

The Trustees of Princeton University. (2010). The E-reader pilot at Princeton: Fall semester, 2009, Final report (long version). Retrieved from http://www.princeton.edu/ereaderpilot/eReaderFinalReportLong.pdf.

The Trustees of Princeton University compiled this research as part of an investigation into how e-readers play a role in academia. The focuses were on paper consumption, classroom experience, and overall e-reader technology.

Three different courses were assigned e-readers based on course material and class size. One undergraduate and two graduate courses were all given Kindle DX e-readers with all the course materials they needed, or they could opt out for traditional text. Throughout the semester, students were to provide feedback regarding their experiences with the Kindle DXs.

Students overwhelmingly noted dissatisfaction with the annotation and highlighting functions. Books purchased through Amazon allowed readers to store their annotations in the cloud, meaning they could be shared, but there was also a limit to how much of the text could be treated this way, ultimately resulting in some students losing their notes. While some believed it to be beneficial because it forced them to not be "serial" highlighters, it complicated note-taking for other students. It was difficult for students to refer back to specific pages because of the organization of the material, and some texts even lost of their value due to the transition from print to digital. Students noted that "[the Kindle DX] is great for pleasure reading, not good for study reading." Similarly, students wished more course readings were available for the Kindle, but did not want more courses to use the Kindle. Many students prefer having a choice. More than half of the

students in the program agreed with the statement "I would pay an additional fee to buy a paper book that I could also load to an e-reader," which lends itself to the notion that some students may prefer convenient aspects of e-readers, but it is all about choice in the end. A student noted there is a "hierarchy of readings," and those on their Kindle were "less essential," and it would be nicer to have printouts of more important readings.

U.S. PIRG Education Fund and the Student PIRGs. (2014, January 27). Fixing the Broken Textbook Market: How Students Respond to High Textbook Costs and Demand Alternatives. Retrieved from http://www.uspirg.org/reports/usp/fixing-broken-textbook-market.

The U.S. PIRG is a consumer group that conducts independent studies into areas that are currently threatening to consumers. Research areas include financial matters, chemical manufacturing, health and safety concerns and more. This study is an investigation into the textbook market and how the high prices exploit students.

The study conducted is primarily secondary research into the costs of textbooks. They also surveyed students to learn more about their textbook preferences and how they use textbooks. The U.S. PIRG found there is a connection for many students between their textbook usage as a result of the high cost of textbooks.

In 2014, it was estimated that students spent an additional $1,200 annually on textbooks and supplies on top of the costs of tuition and fees. Because of the high cost, 65 percent of students reported they do not purchase textbooks because they are too expensive. Additionally, 94 percent of those students who did not purchase the textbooks did so even though they believed it could damage their grade. The number of classes with high textbook costs also deters students from how many and which classes they take each semester. As a possible solution, 82 percent of students said they felt they would perform better in courses if textbooks were available for free online as an open textbook of if the print copy of textbooks was optional.

Venable, M. (2012, January 25). eTextbooks: The Student's Perspective. Retrieved from http://www.onlinecollege.org/2012/01/25/etextbooks-the-students-perspective/.

Melissa Venable has a diverse background in education and technology. Some of the fields she works with are distance education, instructional technology, and as a professor and course designer. Combining these areas makes it imperative Venable has a thorough understanding of the e-textbook market as well as student preferences. This article is a culmination of her research is a compilation of how students perceive e-textbooks and what it means.

The article is composed of secondary research about textbooks and e-textbooks. Venable looks at a variety of studies, but did not connect any surveys of her own.

Venable found there was an increase from 18 percent to 29 percent of students owning a device with an e-textbook on it in just the span of a month in December 2011 and January 2012. Additionally, a survey of 1,200 students in 2011 found 5 percent of students had purchased an e-textbook, and most of them did so because it was required for a course. Students value choice; no matter what the format students end up using, what matters the most to them is that they have a choice between digital and print. However, Indiana University launched a pilot program requiring students to use e-textbooks in their classes, and 60 percent of students preferred the digital format because of the lower cost and the ability for professors to annotate texts. Also, as most students own technology compatible with e-textbooks, 31 percent said they wish instructors would use e-textbooks more. However, students dislike they cannot loan e-textbooks and that they are not always compatible with their specific device.

Webley, K. (2011, July 21). How Much Will Students Really Save Using Amazon's E-Textbooks? Retrieved from http://business.time.com/2011/07/21/how-much-will-students-really-save-using-amazons-e-textbooks/.

Kayla Webley is a staff write for *TIME*, focusing specifically one education and social issues. This article is an examination of the prices of textbooks, both digital and print, with a specific focus on Amazon and their Kindle e-reader.

The Kindle brought a new option into the digital textbook market: the ability to rent e-textbooks. Through secondary research, Webley compares the cost benefits of different textbook options as well as investigates student preferences for digital or print.

Webley found students could save up to 80 percent by renting their textbooks via Amazon Kindle formats. A Kindle rental fee, which allows a minimum of 30 days of access, could potentially be 50 percent the cost of buying a used textbook or owning the Kindle edition. If students need more than 30 days, they are able to extend their rental or purchase the book. These books can be read on any Kindle-enabled device, which extends to tablets that have Kindle apps. In a direct cost comparison of a biology textbook, the new print version was $104.31 and the used print version was $40. However, purchasing a Kindle edition was $39.99, and renting for 30 days started at $18.36. The cost of renting the Kindle edition July through December totaled at $34.08. Although there are perceivable cost benefits, 75 percent of students said they preferred print to digital textbooks. E-textbooks are still on the rise, as the number of students who had purchased an e-textbook increased from 12 to 18 percent in just three months. More services, such as Chegg, Kno, and Inkling, are beginning to offer similar digital rental options.

Wolf, M. (2010, June 29). Our 'Deep Reading' Brain: Its Digital Evolution Poses Questions. Retrieved from http://niemanreports.org/articles/our-deep-reading-brain-its-digital-evolution-poses-questions/.

Maryanne Wolf is a professor at Tufts University and director of the Center for Reading and Language Research. Wolf's research is based within science as well as comprehension from various reading patterns.

Wolf's research takes a further look into history as well as how the brain processes new information from different mediums.

The brain is not wired to constantly process information, so the accelerated attempt at efficiency from digital reading can often damage long-lasting comprehension. The problem with digital reading is not that people may read faster; it is that it is that people may assume speed reading is more efficient. Reading quickly and constantly trying to absorb information can reduce the value

of what has been read, and the "ah ha!" moments, so to speak, of comprehension and insight may not happen if readers do not pause to reflect and continue skimming the next bit of information.